

# CASE STUDY

RO | UF | MBR |

Oil and Gas  
Wyoming, USA



## Toray UF/RO System Treating Mine-Influenced Water to Remove Selenium

### SUMMARY

A Phosphorus mine in Wyoming needed to treat high selenium concentrations (average 0.157 mg/L) leaching into the surface water. A 3-month pilot study of a UF/RO system was conducted to reduce selenium levels under the US EPA's maximum contaminant level (MCL) of 0.05 mg/L, and mitigate impact to the ecosystem, especially aquatic species.

Toray's PVDF TIPS hollow-fiber UF module with 0.01 μm nominal pore size pretreated the RO feed. The pilot indicated little need for cleaning, zero fiber breakages, and more than adequate protection of the RO system as an autopsy of the RO at the end of the study revealed little fouling. Toray's high-rejection energy-efficient RO (TMGD series) removed the selenium at reduced feed pressures, projected to save the plant energy costs for years.

### PROJECT HIGHLIGHTS

- > Selenium rejection consistently at >99% for the pilot study and full-scale plant.
- > The UF system produces SDI ≤3 and turbidity ≤0.1 NTU, effectively protecting the RO from fouling.
- > RO permeate used for UF backwash to assist in reducing selenium levels.
- > The OEM's expert system design and proven durability of Toray's UF and RO membranes resulted in minimal cleaning of the UF and RO systems.
- > Toray's bi-directional brine seal technology TORAYSEAL™ applied to drastically cut RO element loading time, and improve cleaning efficiency.



Full-scale UF (VersaFilter™) and RO systems built by WesTech Engineering, Inc. (photo credit WesTech. [www.westech-inc.com](http://www.westech-inc.com)).

### Integrated Membrane System — 2.9 MGD

Type	UF	RO
Toray model	HFU-2020N	TMG20D-400SR
Membrane material	PVDF	Polyamide composite
No. of trains	3	3
System recovery	97%	75%

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